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UNITED STATES PATENT AND TRADEMARK OFFICE

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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 10/056,494

Filing Date: January 28, 2002

Appellant(s): Cramer, William P.

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Herman H. Bains  
For Appellant

**APPELLANT'S APPEAL BRIEF**

## Appellant's Appeal Brief

### **I Real Party in Interest**

The real party in interest is appellant, William P. Cramer.

### **II Related Appeals and Interferences**

There are no related appeals or interferences.

### **III Status of Claims**

Claims 1,2 and 4-6 are pending in the application and Claim 3 has been canceled. Claims 1,2 and 4-6 are being appealed.

### **IV Status of Amendments**

Appellant filed an amendment (December 6, 2004) after Final Rejection and after Notice of Appeal correcting and removing a redundant phrase appearing in Claim 1 and objected to in the Final Rejection.

### **V Summary of Claimed Subject Matter**

Independent claims 1 and 4 are involved in the appeal. Both of the claims (1 & 4) define a process for providing an intercontinental highway system for mass distribution of energy products including petroleum.

Claim 1 specifies the step of placing a petroleum pipeline (pp. 4, lines 1& 2, Fig. 2 & 3, Ref. no.14) below ground in the median (pp. 4, lines 1 & 2, Fig. 2 & 3 Ref. no. 13) of an interstate highway (pp. 3, lines 19-21, Figs 1-3, Ref. no. 11). The interstate highway is selected from the group of highways in the United States extending in an east-west direction and a north-south direction (Fig. 1). The petroleum pipeline is located below ground in the median and extends longitudinally of the interstate highway throughout a major portion of the length of the highway (Figs. 1-3). The petroleum pipeline is connected to a source (pp. 4, line 3) and is connected to an outlet line (Ref. nos 19, 20) below ground for supplying distributors and end users with petroleum.

Claim 4 defines a process for providing an intercontinental power grid system for mass distribution of energy products including the steps of placing energy product lines

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(pp. 4, line 4, 7-12; Fig. 2, Ref. nos. 14a, 15, 15a, and 16). Claim 4 further specifies the step of continuing the product supply lines longitudinally of the right-of-ways of the interstate highway below the surface of the right-of-ways throughout a major length of the interstate highway (Figs 1-3). Claim 4 also includes the step of connecting each supply line to an outlet line (Fig. 3, Ref. nos. 19, 20) below the surface of the ground at an angle to the supply line.

## VI Grounds of rejection to be reviewed on appeal

One ground of rejection to be reviewed on appeal is the rejection of claims 1, 2 and 4-6 as anticipated under 35 USC 102(b) by the Colonial Pipeline Company web site pages entitled "Terminalling Services", "About Us" and "System Map".

Another related ground of rejection to be reviewed on appeal is the rejection of Claim 1, 2 and 4-6 as obvious under 35 USC 103(a) over the same Colonial Pipeline Company web site pages (Terminalling Services, About Us and Systems Map).

A further ground of rejection to be reviewed on appeal is the rejection of Claims 1, 2 and 4-6 as anticipated under 35 USC 102(b) by the Federal Highway Administration Highway Guide entitled "Utility Relocations, Adjustments, and Accommodation on Federal-Aid Highway Projects (FHWA).

Finally, the ground of rejection to be reviewed is the rejection of Claims 4 and 6 as anticipated under 35 USC 102(b) by "Building the Future-Proof Telco" by David Diamond.

## VII Argument

Claims 1,2 and 4-6 were rejected under 35 USC 102(b) as anticipated by the Colonial Pipeline Company documents entitled "Terminalling Services", "About Us", and "System Map". Anticipation of Claims 1,2 and 4-6 under 35 USC 102(b) was based on inherency. Specifically, it was asserted that "it would be inherent that should the

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pipeline system need to pass or parallel an interstate highway, that proper 'permission' is acquired".

In explaining the rejection, the Examiner notes that "the claims also do not specify a specific length of pipeline. The Examiner then contends that "with the length of underground pipe and all of the interstates traversing the United States, the pipeline would definitely extend below and immediately adjacent the highways for at least some undetermined length".

Appellant will assume that the reference to "the pipeline" in this rejection refers to the Colonial Pipeline system depicted in the "System Map". Apparently it is the position of the Examiner that if the Colonial Pipeline system intersects an interstate highway (probable), or extends parallel to an interstate highway for any distance, then the claims are anticipated by the Colonial Pipeline documents.

Comparing the diagrammatic representation of the interstate highways (Fig. 1 of the drawings) with the diagrammatic depiction of the Colonial Pipeline system (System Map) it is clear that "the pipeline" does not track (follow) any interstate highway. It is also clear that "the pipeline" is not positioned underground in the median of an interstate highway for a major portion of the length of the interstate highway. Finally, it is also clear that "the pipeline" is not positioned underground in the right-of-way of an interstate highway for a major portion of the length of the interstate highway.

It is also clear that the other Colonial Pipeline Company documents do not disclose "the pipeline" as extending longitudinally of an interstate highway median below ground for the major portion of the length of an interstate highway.

Based on the above analysis of the Colonial Pipeline Company documents, appellant contends that these prior art documents do not disclose a petroleum pipeline extending below ground longitudinally of an interstate highway median for a major portion of the length of an interstate highway. This recitation is a definite claim limitation or element. It has been long held that "[A]nticipation requires that a prior art reference disclose every 'claim element as set forth in the claim'. Orthokinetics, Inc. v Safety Travel Chairs, Inc., 806 F 2d 1565, 1 USPQ 2d 1081 (Fed Cir 1986).

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In order to support a rejection based on inherency, the Examiner (PTO) must establish a prima facie case of anticipation by inherency, In re King, 801 F.2d 1324, 231 USPQ 136 (Fed Cir) 1986. That is, it must be established by a prima facie evidentiary showing that the Colonial Pipeline Company documents inherently disclose every claim element as set forth in the claims. The Colonial Pipeline documents do not disclose inherently, expressly or otherwise, a petroleum pipeline positioned below ground in the interstate highway median extending longitudinally of the interstate highway median a major portion of the length of the highway. This is a claim element or limitation.

Since the content of the Colonial Pipeline Company documents does not disclose every claim element as set forth in Claim 1, appellant contends that the Colonial Pipeline Company documents does not and can not anticipate Claim 1 under 35 USC 102 (b). "Anticipation is a finding of fact subject to the clearly erroneous appellate review standard." Chester v Miller, 906 F2d 1561, 15 USPQ 2d 1353 (Fed Cir 1990). It is appellant's contention, based on the foregoing analysis, that the Examiner's conclusion that the claims are anticipated (35 USC 102 b) by the Colonial Pipeline Company documents is clearly erroneous.

However, in support of the anticipation rejection, the Examiner asserts that the claims do not define a specific length of pipeline (specific length apparently meaning feet, miles, kilometers, etc). The claims do define the length of the pipeline in terms of the length of an interstate highway. This limitation is defined in Claim 1 as "continuing the petroleum pipeline longitudinally of the interstate highway median and below ground in the median throughout a major portion of the length of the interstate highway, from a refinery to a distribution center".

Each interstate highway, as diagrammatically illustrated in Fig. 1, has a definite length. Appellant's process uses the interstate highways for providing an intercontinental power grid distribution system. Appellant contends that under the rules of construction, the expression "a major portion of the length of the interstate highway" conveys a quantitative determinable length. A major portion of the length of an interstate highway

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would ordinarily be construed to mean more than one half the length of the interstate highway.

It should be noted that the claims were not rejected as failing to comply with 35 USC 112. Claim limitations of the kind recited in Claim 1 (a major portion of the length of the interstate highway) are definite and determinable as long as those of ordinary skill in the art can readily determine the length (of the pipeline). Orthokinetics, Inc. v Safety Travel Chairs, Inc. supra. One of ordinary skill in the art would readily realize that the expression, the major portion of the length of the highway, would constitute a pipeline length exceeding one half the length of the interstate highway. The claimed length would far exceed the length of a pipeline section incidentally crossing the interstate highway.

The Examiner's interpretation of Claim 1, as reflected in the anticipation rejection, indicates that any finite length of "the pipeline" crossing (intersecting) an interstate highway would correspond exactly to the limitation "continuing the petroleum pipeline longitudinally of the interstate highway median and below the ground in the median throughout a major portion of the length of the interstate highway". This assertion has been made even though there is no disclosure, inherently or otherwise, that "the pipeline" (Colonial Pipeline Company documents) extends longitudinally below ground in the median of an interstate highway for any finite length.

If appellant's interpretation of Claim 1 is correct, then the Examiner's interpretation is badly misplaced. It is appellant's contention that the anticipation rejection based on the Colonial Pipeline Company documents is therefore clearly erroneous.

The claims were also rejected under 35 USC 103(a) as obvious over the Colonial Pipeline Company documents. In this rejection, it is asserted that "it would have been [an] obvious matter of design choice to one of ordinary skill in the art to place a pipeline under the median of a highway, since doing [so] would facilitate laying out of the pipeline from a 'point a' to a 'point b', for example". However, there is no disclosure or suggestion in the Colonial Pipeline Company documents of placing a pipeline under

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the median of an interstate highway to extend longitudinally of the highway for a major or portion of the length of the highway.

As a matter of fact there is no suggestion in the prior art of placing even one pipeline unit longitudinally below ground in the interstate highway median. What is the basis for the obviousness rejection of Claim 1 that it is a matter of design choice to one of ordinary skill in the art to place the pipeline in the highway median when planning a pipeline route? There is no prior art of record to suggest this design choice.

In the amendment filed December 8, 2003 appellant enclosed several exhibits including Exhibit 2 which are web site pages from Interstate Natural Gas Association of America entitled "Public Education". Although the "Public Education" document relates to gas pipeline systems, the practice of the pipeline route engineers (those of ordinary skill in the art) in terms of the criteria for pipeline route selection is believed to be the same for petroleum pipeline route planners.

The content of the "Public Education" document indicates that gas pipeline engineers do not select the median of interstate highways as routes. For example, highways and major roads are crossed rather than using the highway median as the means of defining a route (see page 8) of the "Public Education" document. There is no disclosure or suggestion in the Colonial Pipeline Company documents that the pipeline planners used any interstate highway median as a route throughout the 5,519 miles length of the system.

Since the Colonial Pipeline Company documents were relied on in the 35 USC 103(a) rejection, these documents do indicate the practice of those of ordinary skill in the art. Since there is no suggestion in the Colonial Pipeline Company documents that those of ordinary skill in the art (pipeline route planners) ever used an interstate highway median as a pipeline line for even the smallest extent, appellant contends that the proposed modification of the Colonial Pipeline system and the rejection of Claim 1 as obvious under 35 USC 103(a) is erroneous. Moreover, the "Public Education" document also reflects that gas pipeline route planners do not use interstate highway medians as the route for petroleum or gas pipelines.

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Claims 1,2 and 4-6 were also rejected under 35 USC 102(b) as being anticipated by the Federal Highway Administration Program guide, entitled "Utility Relocation, Adjustments, and Accommodation on Federal-Aid highway Projects" (FHWA). The Examiner contends that the FHWA discloses the provision of utility pipelines along the right-of-way of highways. It is difficult to understand how FHWA anticipates Claim 1 when there is no disclosure or suggestion of a petroleum pipeline located in an interstate highway median and extending longitudinally thereof.

Since there is no disclosure of a petroleum pipeline using the highway median as a route, the rejection of Claims 1 and 2 under 35 USC 102(b) as anticipated by FHWA is clearly erroneous.

With respect to Claims 4-6, the FHWA document does not disclose placing a petroleum pipeline or any energy product supply line in an interstate highway right-of-way and extending the energy supply line a major length of the interstate highway. The FHWA discloses placing fiber optics and wireless towers adjacent the edge of the freeway. There is no indication that utility pipe culverts or box culverts would extend the major length of an interstate highway. Such box culverts or pipe culverts would only be placed adjacent on edge of a right-of-way in conjunction with other highway construction. It is noted that FHWA does not specifically mention petroleum pipelines (Claim 5). Appellant contends that the rejection of Claim 1,2 and 4-6 under 35 USC 102(b) over FHWA is therefore clearly erroneous.

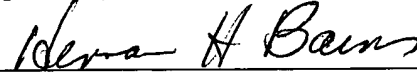
Claims 4 and 6 were rejected under 35 USC 102(b) as being anticipated by "Building the Future-Proof Telco" by David Diamond. Diamond discloses laying fiber optic cables primarily along railroads. Some fiber optic cables are apparently located along interstate highways. Clearly, even if the optic cables are located adjacent interstate highways, it does not appear that fiber optic cables are located in the right-of-way and extend a major portion of the length of the interstate highway. Accordingly, appellant contends that the rejection of Claim 4 and 6 under 35 USC 102(b) over the David Diamond publication is clearly erroneous.



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In view of the arguments presented herein, appellant respectfully requests that the final rejection of Claims 1, 2 and 4-6 be reversed and the application passed to issue.

Respectfully submitted



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I hereby certify that Appellant's Corrected Appeal Brief (3 copies) is being deposited with the U.S. Postal service as first class mail in an envelope addressed to: Mail Stop Appeal Brief-Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Date July 18, 2005.



Person Signing

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**VIII CLAIM APPENDIX**

Claim 1. A process for providing an intercontinental power grid distribution system using the interstate highway system for the mass distribution of energy products including petroleum, comprising

placing a petroleum pipeline below the ground surface of the median of an interstate highway, the interstate highway selected from the group consisting of interstate highways of the United States extending generally in an east-west direction and interstate highways of the United States extending generally in a north-south direction, continuing the petroleum pipeline longitudinally of the interstate highway median and below ground in the median throughout a major portion of the length of the interstate highway, from a refinery to a distribution center,

connecting the petroleum pipeline to a source of petroleum,

connecting the petroleum pipeline to an outlet line extending at an angle below the ground for supplying distributors and end users with petroleum.

Claim 2. The process as defined in Claim 1 and providing pumping stations for each petroleum pipeline and interconnecting each petroleum pipeline to a pumping station for maintaining the pressure in the petroleum pipeline.

Claim 4. A process for providing an intercontinental power grid system using the interstate highway system for the mass distribution of energy products including petroleum, gas, electricity, gasoline and fiber optics, comprising

placing energy product supply lines below the surface of the ground of the interstate highway right-of-ways immediately adjacent the interstate highway, the interstate highway selected from the group consisting of interstate highways of the United States extending generally in an east-west direction and interstate highways of the United States extending generally in a north-south direction, continuing the product

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supply lines longitudinally of the right-of-ways of the interstate highways and below the surface of the right-of-ways throughout a major portion of the length of the interstate highway, from a source of energy product to a distribution center.

connecting each supply line to a source of an energy product,  
connecting each supply line to an outlet line located below the ground and at an angle relative to a supply line.

Claim 5. The process as defined in Claim 4 wherein the energy product is petroleum, providing pumping stations for each petroleum supply line and interconnecting each petroleum supply line to a pumping station for maintaining the pressure in the petroleum supply line.

Claim 6. The process as defined in Claim 4 wherein the energy product is electricity.

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**IX Evidence Appendix**

Exhibit I Association of Oil Pipe Lines (AOPL) – How Pipelines Work

Exhibit II Interstate Natural Gas Association of America – Public Education

Exhibit III Koch Industries – techapplication

Exhibit IV Pipeline Maps – Michigan Public Service Commission

Exhibits I – IV were submitted in an Amendment dated December 8, 2003. The Exhibits were tacitly entered by the Examiner in an Official Action dated March 24, 2004 as embodied in the language of paragraph 5, "Applicant's arguments filed December 8, 2003 have been fully considered..."

*Exhibit 7***Association of Oil Pipe Lines****AOPL****An American Supply Line - Moving the Energy and Raw Materials of Our Daily Lives**

Select a

**About Pipelines**

Why Pipelines?

Economy, Jobs  
and DefensePipelines in Our  
Daily Lives

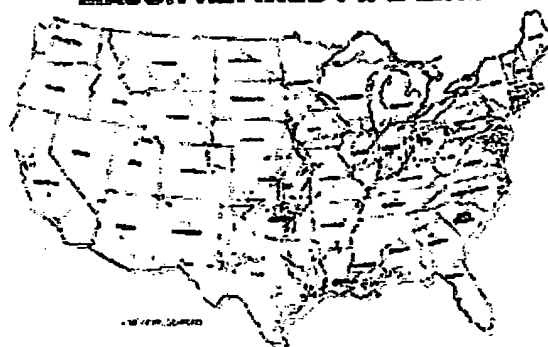
How Pipelines Work

Answers to Common  
Questions

Emerging Technologies

**Pipeline Safety****Prevent Accidents:  
Dig Safely!****About AOPL****Publications &  
Resources****News Room****Contact Us****Home****How Pipelines Work**

The nation's oil pipelines transport crude oil from oilfields to refineries where the oil is turned into dozens of useful products such as gasoline, home heating oil, jet fuel, diesel, lubricants and the raw materials for fertilizer, chemicals and pharmaceuticals. They then transport refined products to depots that distribute them to the companies and consumers that daily rely on a steady and cheaply transported supply of these products.

**MAJOR CRUDE OIL PIPELINES**[Click here for a larger image](#)**MAJOR REFINED PIPE LINES**[Click here for a larger image](#)

Pipeline pathways first transport crude oil from oil fields and coastal shipping terminals to refineries. Then, after the oil is processed, pipelines handle the second part of the journey - transporting gasoline, jet fuel, heating oil, diesel and other refined products to distribution centers.

Many different kinds of oil and oil products are shipped through pipelines in batches. The physical principles of hydraulics keep the batches of liquid from blending and contaminating one another except where they actually touch. These "interfaces" between different shipments are separated out when they arrive at their destination and are reprocessed.

pipeline pigs.

The first oil pipeline in the United States was built in 1865, following the discovery of oil in Pennsylvania. By the early 1900s, major discoveries had been made in Texas, Oklahoma and Kansas and pipelines had become a common method of moving crude oil. However, these early pipelines have long since been decommissioned. They were small diameter pipes that were quite inefficient by today's standards.

Leading up to World War II, pipeline companies were operating a maze of these small-diameter pipes laid out in parallel in order to carry enough capacity to fulfill the nation's needs for petroleum. Pump stations were powered by diesel engines, and were usually spaced every 30 miles. Each of these pump stations had to be manned around the clock to keep the system operating properly and the coordination of these multiple operating stations meant there was a lot more opportunity for human error.

Following the war, a technological revolution took place. The need for technological improvements in oil pipelines was driven by three factors.

- Consumer demand for petroleum in the prosperity of the Fifties.
- The growth of American industry that took place during the war.
- Increasing awareness of the importance of petroleum to the nation's security interests following wartime gasoline rationing. (More than 100 military bases and other facilities have their own direct connections with oil pipelines.)

Today, technology allows the manufacture of large diameter and much more efficient pipeline systems and pump stations are primarily driven by clean electrical power.

Nearly all of the vast volume of petroleum now transported by pipeline moves through highly automated systems - automation that has been a major factor in reducing the number and volume of pipeline spills. These computer-aided systems allow highly trained operators working in sophisticated central control rooms to monitor rates of flow, pressures and fluid characteristics. Fluctuations can be detected quickly, alerting operators to potential leaks and allowing them to shut down lines and dispatch crews to investigate.

### MAJOR REFINED PIPE LINES



[Click here to close](#)

## MAJOR CRUDE OIL PIPELINES

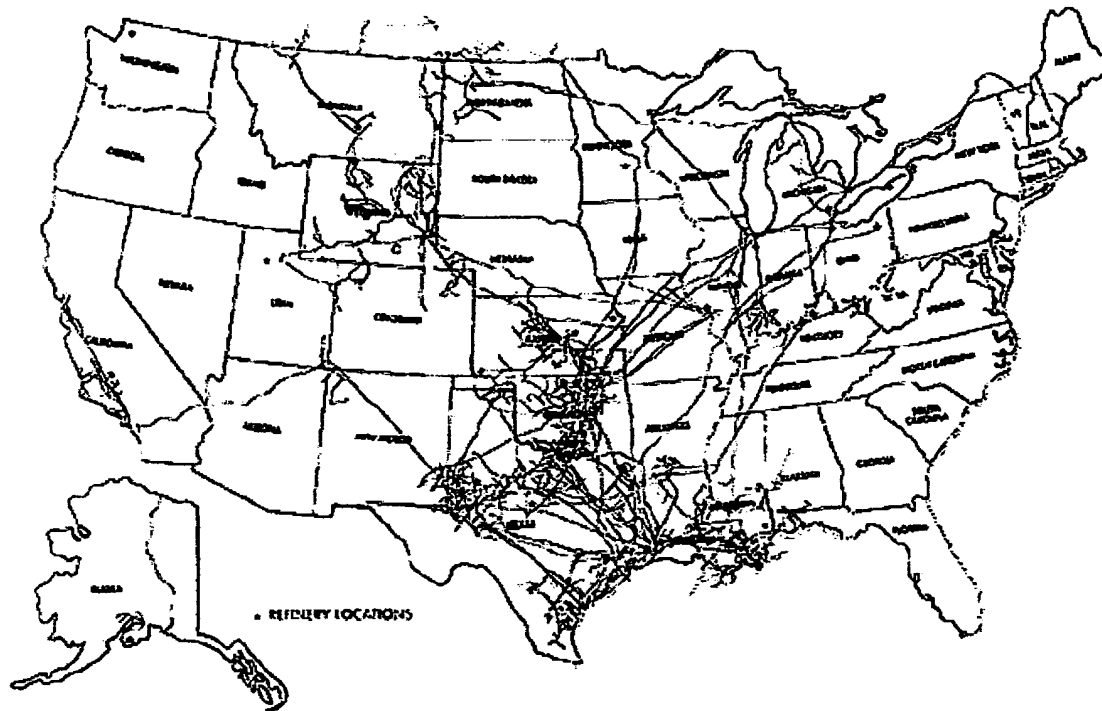




Exhibit 2

# Interstate Natural Gas Association of America

Main | Safety | Environment | FERC | Foundation | What's New | Education | Contact

- Natural Gas
- Interstate Gas Pipeline Systems
- Construction
- Operations
- Public Responsibilities
- Other Resources

## Public Education

### • Pipeline Construction

#### Project Planning

Project planning begins with the basics of supply and demand. If there is a need for natural gas, conduct a market analysis to estimate the size of the market. This gas supply requirement is typically in terms of million cubic feet of gas per day. With this information engineers can begin to estimate the transport of the required volumes of gas, including the basic design parameters of pipeline diameter, thickness and the cost to construct the pipeline facilities.

#### Design

The size of interstate pipelines varies, but in most cases a mainline, the major principal or main line, is in the range of 16 to 48 inches in diameter. Laterals, which are smaller diameter pipelines that branch off the mainline or take gas from the mainline, typically are 6 to 16 inches in diameter.

The exact diameter of a pipeline and the gas it is designed to deliver is determined by the gas volume to be delivered - which the pipeline company will be operated. In order to meet customer delivery requirements most interstate pipelines operate at a pressure of at least 600 pounds per square inch (psi), typically about 1,000 psi.

The wall thickness of the pipeline is determined by the maximum operating pressure (MAOP), published industry standards and federal regulations. The pipeline incorporates a design safety factor. The pipeline must also meet DOT's federal regulations, that is related to the type of construction and population density along the route.

Engineers initially identify preliminary pipeline routes that will minimize impact to the public, public lands, and the environment. The pipeline company, typically will go through a process of reviewing available maps, aerial photography, and available published environmental data to determine a number of possible alternative routes, and characteristics of the region. This desktop work will then be augmented by use of aerial and ground surveys to identify and select a preferred route. \*

Once a preferred route is identified, the pipeline company will begin contacting landowners to discuss the project and seek permission to conduct civil and environmental surveys. These surveys are required for use in the detailed pipeline design and for preparing local, state and federal permit applications. Even though pipeline officials may begin discussions with landowners at this point, it is important to remember that the project is undergoing a feasibility analysis, and neither the project nor the pipeline route is finalized at this time. Selecting a pipeline route often involves discussing and evaluating options with landowners, environmental agencies and regulatory officials. If the market analysis ultimately justifies the cost of pipeline construction, only then will the pipeline company begin seeking permits and preparing a detailed project application for the Federal Energy Regulatory Commission (FERC).

#### Permits

Prior to construction, a pipeline company must obtain numerous local, state and federal permits. These permits address all of our natural resources—land, air, water, vegetation and wildlife, as well as the general public. The requirements vary with the specific project, but some of the typical permits are:



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### Local

- Building, road crossing permits
- Road crossing permits

### State

- Land (Erosion and Sedimentation Permit)
- Water (Hydrostatic Testwater Acquisition and Discharge Permit, Stormwater Discharge Permit)
- Stream and River Crossings (State Environmental Agency)
- Cultural Resources Preservation (State Historic Preservation Office)
- Threatened and Endangered Species Preservation (State Fish & Wildlife Agency)
- Air Emissions (State Environmental Agency)
- Noise (State Environmental Agency)

### Federal

- Wetlands Preservation and Crossings (U.S. Army Corps of Engineers)
- Streams and Rivers (U.S. Army Corps of Engineers)
- Threatened and Endangered Species (U.S. Fish & Wildlife Agency)
- Air Emissions (U.S. Environmental Protection Agency)
- Environmental Resource Reports

Copies of all permits and permit applications are submitted to the FERC with the project filing.

### FERC Filing

In order to get an interstate gas pipeline approved for construction, the pipeline company must file a detailed project plan with the (FERC). Among other things this plan includes maps showing the preliminary pipeline route, a description of the proposed pipeline facilities, and up to 12, specific environmental resource reports. These resource reports cover topics such as water use and quality, vegetation and wildlife, cultural resources, socio-economics, geological resources, soils, land use, air and noise quality and project alternatives. A copy of the company's application may be obtained from the FERC's Public Reference Room (202-208-1371) for a nominal fee though they are usually made available at local public places such as libraries in the area through which the pipeline will traverse.



The FERC has the authority to approve the pipeline location and construction. It does so through Certificate of Public Convenience and Necessity (Certificate). Before the commission will authorize however, it thoroughly reviews the project to determine if it is in the public interest. This review includes need for the project, costs of transporting natural gas by the pipeline, financing and market competition. The commission also conducts an Environmental Assessment or an Environmental Impact Study to evaluate the impact on the public and the environment.

Part of the Commission's review process includes public meetings in the communities to be affected. Announcements of these public meetings are published in local newspapers. The meetings allow the local community to ask questions and express any comments or concerns about the project.

The time required for the review process varies based on the size of the project, but typically it takes from the time a company submits an application until the Commission renders their decision as to whether they will approve a certificate for a project. Once the certificate is issued, the commission will authorize construction when the conditions they established in their order issuing the certificate are satisfied.

For information, the Process is generally as follows:

1. File Application
2. Public meeting in about 6-8 weeks

3. Review application
4. Issue a P.O.
5. Issue DEIS
6. Another round of public meetings
7. Issue FEIS
8. Issue/deny certificate

#### Acquisition of Rights of Way

The acquisition of a pipeline right-of-way often raises many questions with landowners - "Why is this the route for the pipeline? Why is the pipeline needed? What is the procedure for acquiring approval for use of my land? How will I be compensated? How will the land be restored after construction? Can I use the land after the pipeline is installed?"



To answer those questions, let us look first at the process. The cornerstone of the right-of-way acquisition process is the negotiation of an Easement Agreement. This agreement covers key issues such as compensation, restoration of the land and restrictions on future use of the land. Once the pipeline route is selected, a right-of-way agent from the pipeline company will contact each affected landowner along the route to discuss the project and negotiate an easement agreement.

In addition to a permanent easement the company requires to operate and maintain its pipeline after it is constructed, the company also requires a temporary easement during construction. The permanent easement typically is about 50 feet wide and the temporary easement typically will range between an additional 50 to 75 feet depending on the size of pipeline, larger pipelines require the use of bigger equipment and more room to operate. The amount of workspace required is also dependent on the type of terrain being crossed and any special construction requirements.



The landowner is normally compensated a fair market value for the permanent easement, which while typically allows the landowner continued use and enjoyment of their property, but with some limitations. The limitations typically prohibit structures and trees within the easement in order to preserve safe access of maintenance equipment when necessary and allows for uninhibited aerial inspection of the pipeline system.

The landowner is generally compensated a lower value for the use of the temporary construction easement, since this land reverts back to the landowner after construction for their full use and enjoyment without any restrictions.

Additionally, landowners are compensated for any damages/losses they may incur as a result of the construction across their property, such as loss of crop revenues.

Sometimes, the landowner and the pipeline company may not be able to reach agreement on th If the commission determines there is a public need for the pipeline, it will grant the pipeline company eminent domain - the right of the government to take private land for public use, the same telecommunications companies, railroads and the transportation infrastructure in the U.S. It is in for pipeline projects, eminent domain applies only to the specific facilities and uses authorized by or federal courts then supervise the fair compensation and treatment of the landowner.

Process is as follows:

- a) Natural Gas Act gives eminent domain authority if you get a certificate for a project, FERC do only the certificate that is needed for all the public good.
- b) Commission does not give access! You have to take your eminent domain rights to the courts access to the property.
- c) The government does not take the private land - the laws of the county allow us the rights to a

## Pipeline Construction

A pipeline construction project looks much like a moving assembly line. A large construction project is broken into manageable lengths to be constructed by a fully equipped, highly specialized qualified work construction spreads. Each spread is composed of various crews, each with its own set of responsibilities. When one spread completes its work, the next crew moves into position to complete its piece of the construction project. A construction spread may be 30 to 100 miles in length, with the front of the spread clearing the right-of-way and restoring the right-of-way.

This schematic graphically illustrates the activities involved in a construction spread.



Artwork reproduced with permission of Petroleum Extension Service, The University of

## Clearing & Grading

The survey crew carefully surveys and stakes the construction right-of-way to ensure that only the pre-approved construction workspace is cleared. The Clearing and Grading crew leads the construction spread. This crew is responsible for removing trees, boulders and debris from the construction right-of-way and preparing a level working surface for the heavy construction equipment that follows. The crew installs silt fence along edges of streams and wetlands to prevent erosion of disturbed soil. Trees inside the right-of-way are cut down, and the contractor removes or stacks the timber along the side of the right-of-way for the landowner. Brush is commonly shredded or burned. As may be necessary for some projects in agricultural areas, topsoil may also be stripped to a predetermined depth and stockpiled along the sides of the right-of-way.



## Stringing

Generally, the pipe is transported from the pipe mill to a pipe storage yard in the vicinity of the pipeline location. The pipe lengths are typically 40 to 80 feet long. A stringing crew using specialized trailers moves the pipe from the storage yard to the pipeline right-of-way. The crew is careful to distribute the various pipe joints according to the design plan since the type of coating and wall thickness can vary based on soil conditions and location. For example, concrete coating may be used in streams and wetlands, and heavy wall pipe is required at road crossings - and in special construction areas.



## Trenching

The trenching crew typically uses a wheel trencher or backhoe to dig the pipe trench. The U.S. Department of Transportation requires the top of the pipe to be buried a minimum of 30 inches below the ground surface in rural areas, so the depth of the trench is at least five to six feet deep for pipe 30 to 36 inches in diameter. The pipe is buried even deeper at stream and road crossings.

If the crew finds large quantities of solid rock during the trenching operation, it uses

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special equipment or explosives to remove the rock. The contractor uses explosives carefully, in accordance with state and federal guidelines, to ensure a safe and controlled blast.

In cultivated areas the topsoil over the trench is removed first and kept separate from the excavated subsoil, a process called topsoiling. As backfilling operations begin, the soil is returned to the trench in reverse order with the subsoil put back first, followed by the topsoil. This ensures the topsoil is returned to its original position.

### Pipe Bending

The pipe bending crew uses a bending machine to make slight bends in the pipe to account for changes in the pipeline route and to conform to the topography.

The bending machine uses a series of clamps and hydraulic pressure to make a very smooth, controlled bend in the pipe. All bending is performed in strict accordance with federally prescribed standards to ensure integrity of the bend.

### Welding

The pipe gang and a welding crew are responsible for welding, the process that joins the various sections of pipe together into one continuous length. The pipe gang uses special pipeline equipment called side booms to pick up each joint of pipe, aligns it with the previous joint and makes the first part (pass) of the weld. The pipe gang then moves down the line to the next section repeating the process. The welding crew follows the pipe gang to complete each weld. Depending on the wall thickness of the pipe, three or more passes may be required to complete each weld.

In recent years contractors have used semi-automatic welding units to move down a pipeline and complete the welding process. Semi-automatic welding, done to strict specifications, still requires qualified welders and personnel are required to set up the equipment and conduct hand welding at connection points and crossings.

As part of the quality assurance process, each welder must pass qualification tests to work on a particular pipeline job, and each weld procedure must be approved for use on that job both in accordance with federally adopted welding standards. Welder qualification takes place before the project begins. Each welder must complete several welds using the same pipe as that to be used in the project. The welds are then evaluated by placing the welded material in a machine and measuring the force required to pull the weld apart. It is interesting to note that the weld has a greater tensile strength than the pipe itself.

A second quality assurance test ensures the quality of the ongoing welding operation. To do this, qualified technicians take X-rays of the pipe welds to ensure the completed welds meet federally prescribed quality standards. The X-ray technician processes the film in a small, portable darkroom at the site. If the technician detects any flaws, the weld is repaired or cut out, and a new weld is made. Another form of weld quality inspection is one employing ultra sonic technology.

### Coating

Line pipe is externally coated to inhibit corrosion by preventing moisture from coming into direct contact. Normally, this is done at the mill where the pipe is manufactured or at another coating plant local to the construction site.

All coated pipe, however, has uncoated areas three to six inches from each end to prevent the coating from interfering with the welding process. Once the welds are made, a coating crew coats the field joint, the area

the pipeline is lowered into the ditch.

Pipeline companies use several different types of coatings for field joints, the most common being polyethylene heat-shrink sleeves. Prior to application, the coating crew thoroughly cleans the pipe with a brush or sandblast to remove any dirt, mill scale or debris. The crew then applies the coating - a process that begins prior to lowering the pipe into the trench.

Prior to lowering the pipe into the trench, the coating of the entire pipeline is inspected to ensure no defects.

#### Lowering-In

Lowering the welded pipe into the trench demands close coordination and skilled operators. Using a series of side-booms, which are tracked construction equipment with a boom on the side, operators simultaneously lift the pipe and carefully lower the welded sections into the trench. Non-metallic slings protect the pipe and coating as it is lifted and moved into position.



In rocky areas the contractor may place sandbags or foam blocks at the bottom of the trench prior to lowering-in to protect the pipe and coating from damage.

#### Backfilling

Now that the pipe has been placed in the trench, the backfilling of the trench can begin. This can be accomplished with either a backhoe or padding machine depending on the soil makeup. As with previous construction crews, the backfilling crew takes care to protect the pipe and coating as the soil is returned to the trench. As the operations begin, the soil is returned to the trench in reverse order, with the subsoil put back first, followed by the topsoil. This ensures the topsoil is returned to its original position in areas where the ground is rocky and coarse, crews screen the backfill material to remove rocks, or bring in clean fill to cover the pipe or the pipe is covered with a material to protect it from sharp rocks. Once the pipe is sufficiently covered the coarser soil and rock can be used to complete the backfill.



#### Hydrostatic Test

After completion of the construction steps described above, but before the pipeline is put into natural gas service, the entire length of the pipeline is pressure tested using water. The hydrostatic test is the final construction quality assurance test. Requirements for this test are also prescribed in DOT's federal regulations. Depending on the varying elevation of the terrain along the pipeline and the location of available water sources, the pipeline may be divided into sections to facilitate the test. Each section is filled with water and pressured up to a level higher than the maximum pressure the pipeline will be operated at. The test pressure is held for a specific period of time to determine if it meets the design strength requirements and if any leaks are present. Once a test section successfully passes the hydrostatic test, water is emptied from the pipeline in accordance with state and federal requirements. The pipeline is then dried to ensure it has no water in it before gas is put into the pipeline.



#### Restoration

The final step in the construction process is restoring the land as closely as possible to its original condition. Depending on the requirements of the project, this process typically would involve decompacting the construction work areas, replacing topsoil, removing large rocks that may have been brought to the surface, completing any final

repairs to irrigation systems or drain tiles, apply lime or fertilizer, restoring fences, etc. The restoration crew carefully grades the right-of-way and in hilly areas, installs erosion prevention measures such as interceptor dikes, which are small earthen mounds constructed across the right-of-way to divert water. The restoration crew also installs riprap, consisting of stones or timbers, along streams and wetlands to stabilize soils. As a final measure the crew may plant seed and mulches the construction right-of-way, to ensure it is restored to its original condition.

## **SPECIAL CONSTRUCTION TECHNIQUES**

### **Open Cut River and Stream Crossings**

This crossing method involves excavating a trench across the bottom of the river or stream to be crossed with the pipeline. Depending on the depth of the water, the construction equipment may have to be placed on barges or other floating platforms to excavate the pipe trench. If the water is shallow enough the contractor can divert the water flow with dams and flume pipe to allow backhoes, working from the banks or the streambed, to dig the trench.

The contractor prepares the pipe for the crossing by stringing it out on one side of the stream or river and then welding, coating and hydrostatically testing the entire pipe segment. Sidebooms carry the pipe segment into the streambed, similar to construction on land, or the construction crew floats the pipe into the river with flotation devices and positions it for burial in the trench. Concrete weights or concrete coating ensures the pipe will stay in position at the bottom of the trench once the contractor removes the flotation devices.

### **Directional Drilling**

Another crossing method is the use of directional drilling. While not always feasible, this method avoids the excavation of a trench across the bottom of the crossing. It is a method considered for longer crossings and requires special geological conditions at the crossing location. Basically, it involves drilling a hole large enough for the pipeline to be pulled through it and in the shape established by the designers.

Before a directional drill can be designed, core samples must be taken on both sides of the crossing to evaluate the underground rock and sand formations. If the subsurface will support a directional drill, the engineer can design a crossing that establishes the entry point, the exit point of the pipeline crossing and its profile as it would traverse under the crossing.

While this drilling is in progress, the line pipe sections are strung out on the far side of the crossing, to be welded. Once welded the joints are X-rayed, coated, hydrostatically tested and the preparation for being pulled back through the drilled out hole.

Once the drilling operation is complete the cutting head is removed and the drill string is attached segment. The crew uses the drilling rig to pull the pipeline segment back through the drilled hole.

connected into the pipeline on both ends.

### **Wetlands**

"Pipelining" in wetlands or marshes requires another special construction technique. In one technique, crews place large timber mats ahead of the construction equipment to provide a stable working platform. The timber mats act much like snowshoes, spreading the weight of the construction equipment over a broad area. The mats make it possible to operate the heavy equipment on the unstable soils.



### **Road Bores**

For crossing most small roads pipeline contractors use the "open-cut" method. Traffic is diverted, a trench is dug across the road and the pipeline is installed. The contractor subsequently repairs the pavement.

For highways and major roads with heavy traffic, pipeline contractors often use road bores to install a pipeline. In a directional drill for river crossings, the road bore is accomplished with a horizontal drill rig, a boring machine drills a hole under the road to allow insertion of the pipe. In some instances a casing is drilled the hole, and the gas pipeline is inserted inside the casing. The benefit of the road bore is that it allows installation of the pipeline without disrupting traffic.



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## Blending Light With Heavy Crude Oil To Increase Pipeline Capacity

### The Challenge: Cost-Effectively Move Heavy Crude Oil to Market

The Koch and Marathon/Ashland refineries in the Twin Cities area of Minnesota needed to increase their feedstock supplies to meet increased market demand for a variety of products including gasoline, fuel oil for home heating, jet fuel, asphalt, and even carbon dioxide. These products are all made from crude oil delivered to the refinery by Koch Industries subsidiary, Minnesota Pipe Line Company. Minnesota Pipe Line carries oil from Canada and western North Dakota to refineries for further processing along an overall 679-mile (1093 km) route. (See Figure 1).

The feedstock passes through nine pumping stations in Minnesota on the 250-mile (402 km) route between Clearbrook and Rosemount. All are powered by large electric motors that provide the needed force to move the oil through the line. Some pumping stations, such as the one at Clearbrook, serve as hubs where oil is stored in holding tanks until needed, blended with other grades of oil, and/or directed to the locations where it is most needed. More than 60 percent of the crude oil carried by the line is characterized as highly viscous. The thick, heavy characteristics of this oil makes movement through the pipeline more difficult and causes pump motors to work harder, increasing the energy requirements and costs for delivery of the oil to the plant. During the winter, cold temperatures cause the drag of the crude oil to be even more pronounced, slowing delivery rates and increasing the amount of energy consumed to move each barrel of oil through the line.

Koch Pipe Line Company, Otter Tail Power Company, and Northern States Power Company (NSP) worked together to implement a low capital cost approach,

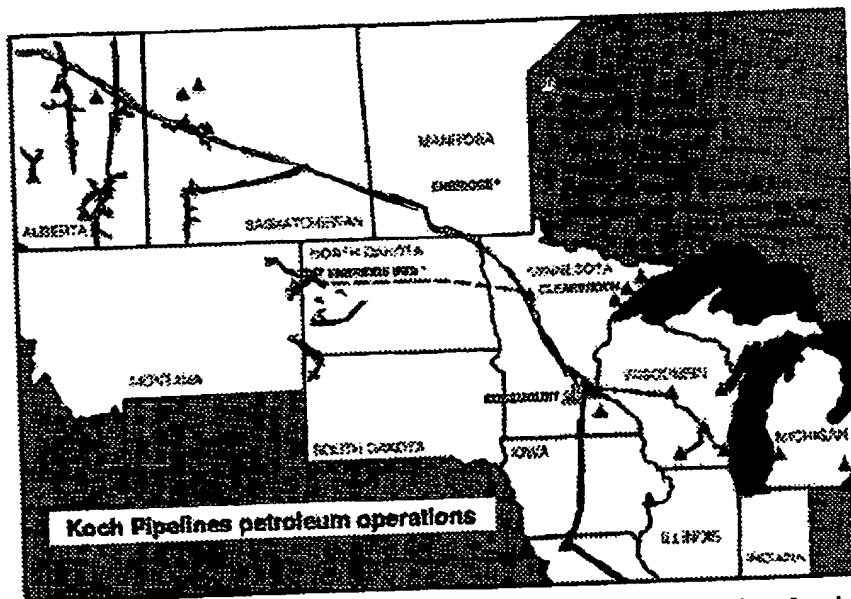


Figure 1. Minnesota Pipe Line, a subsidiary of Koch Industries, increased the flow of crude oil from its Clearbrook pumping station to the Rosemount refinery and saved energy by blending high viscosity crude with low viscosity crude.

which actually saved energy, while increasing pipeline capacity.

### The Old Way

The conventional approaches to this type of problem are to either add a parallel pipeline or add midpoint pumping stations to increase the throughput in existing lines. Both approaches would have more than provided the added capacity that Koch sought. However, initial construction costs were comparatively high, and both methods would have increased ongoing power consumption and demands.

### The New Way

In 1997 Minnesota Pipe Line implemented an operation at the Clearbrook site to blend high-viscosity crude with lower-viscosity crude to create a new grade of crude with better flow characteristics. Special metering equipment was used to automate the oil-blending process. Variable speed drives, which improve the efficiency

of motor-driven processing and pumping systems, were installed to control several 1000-horsepower motors at the Clearbrook site. Additional work was done at the Hugo, MN facility just up stream of the Rosemount Refinery. The willingness of Minnesota Pipe Line's refinery customers to accept consistently blended oil deliveries allowed the project to proceed.

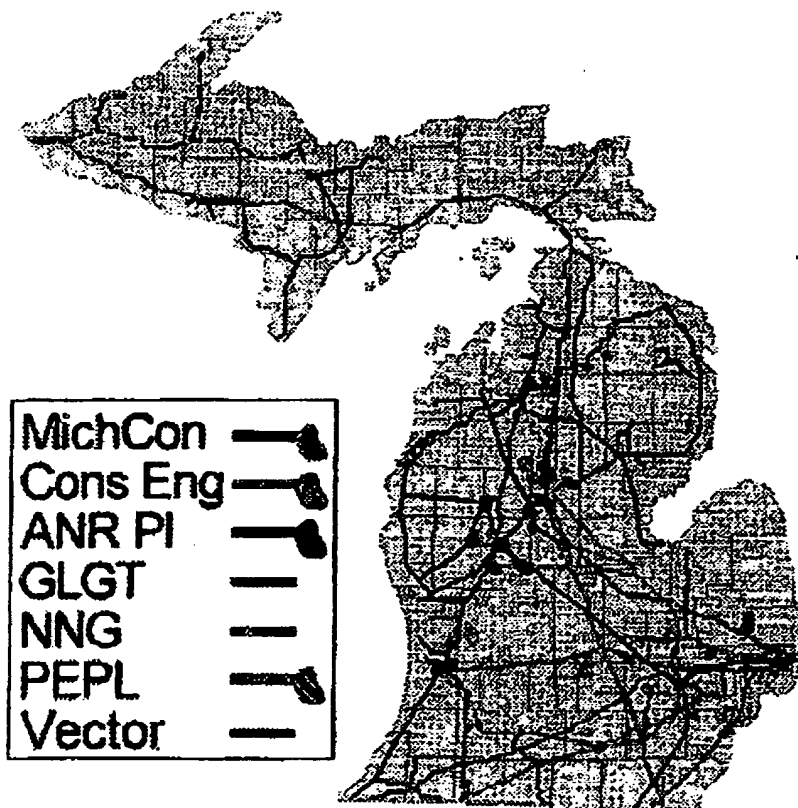
### The Results: Low Capital Cost and Reduced Operating Cost

This project gave a dramatic increase in pipeline capacity for a relatively low cost. And, it carried the added benefit of reducing power consumption and demand for the overall system at the previous flow rates. In addition the project reduced energy demands at the eight other pumping stations along the pipeline's route between Clearbrook and Rosemount.

## Pipeline Maps

presented by Michigan Public Service Commission

Natural Gas Transmission Pipeline and Storage field map - presentation version



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Map prepared by Michigan Public Service Commission  
May, 2000 - Revised December, 2002

Source: Michigan Consolidated Gas Company map of major natural gas pipelines and  
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